Annual report to

FLORICULUTRE NURSERY RESEARCH INITIATIVE

and

UNITED STATED DEPARTMENT OF AGRICULULTURE
AGRICULTURAL RESEARCH SERVICE

for the period of

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PROJECT

Evaluation of locally available resources for use as alternative soil-less substrates in container-grown plant production for the Upper Midwest region of the United States.

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SYNOPSIS

Situation: Pine bark is the primary component in container substrates used by Ohio and other Upper Midwest growers. Pine bark is typically imported from southern states such as Louisiana, Georgia, and North Carolina. Availability of pine bark has decreased over the past 5 to 10 years and continues to decrease as its bioenergy value increases. Coupled with this decrease in availability is an increase in price and transportation costs from distant southern states. While Upper Midwest states lack a forestry industry to supply bark and other wood materials, they have large acreage of farmland that can generate other biomass materials. The goal of our project was to determine if biomass/bioenergy crops grown in Upper Midwest states could be harvested and processed into a suitable substrate.

Program Effort: This year constituted our second year of research on switchgrass (*Panicum virgatum*). We have already developed a successful base substrate composed of 60% switchgrass, 20% pine bark, 15% sphagnum peat, and 5% compost (municipal solid waste compost, already used by a majority of Ohio nursery growers in standard substrates). However,

there were still issues that we needed to resolve concerning Fe and Ca nutrition, pH stability, interactions with herbicides, and N dynamics. Experiments were initiated to resolve those issues and further refine our switchgrass-based substrate.

To complement our switchgrass research, we also wanted to pursue other materials that might have promise. In collaboration with Jim Owen at Oregon State University, we explored the use of bamboo. Due to biomass generation issues, this is probably more suitable to the Pacific Northwest or southern states, but the high lignin content and potentially high biomass potential made this material worth exploring. Rapid adoption of giant miscanthus (*Miscanthus ×giganteus*) as a biofuel crop in our area prompted more intense evaluation of that material (some initial work had already been done). The large acreage committed to wheat production in Ohio prompted us to evaluate it as a potential alternative. Wheat straw has the advantage of already being available in large quantities while other biomass crops would have to ramp up production on considerably more acreage to meet the demand by nursery growers. All research with these materials was initiated to determine their basic properties in small-container production.

Results and Impacts: While much of this data is still awaiting laboratory and statistical analyses, we have made some preliminary observations and conclusions. Standard fertilizer practices will provide all necessary Ca and Fe in switchgrass substrates, without the need for supplemental fertilization. Herbicides perform similarly in switchgrass substrates compared to pine bark substrates. Nitrogen dynamics in these substrates is still being evaluated, but we have concluded that dibbling controlled release fertilizers results in less N immobilization than other fertilizer application methods.

In conjunction with the research that took place at our facility, collaborators at North Branch Nursery potted 10 yd^3 of our switchgrass substrate to compare to their traditional pine-bark substrate. The growers at North Branch were excited to see that all plants in switchgrass substrates performed equal to those in the traditional substrate. This nursery is currently exploring ways to acquire their own source of wheat straw to duplicate the study. We are working closely with them to document and assist in their efforts.

Research is still on-going with other alternative substrates (wheat straw, miscanthus straw, etc.). Those materials respond similarly to switchgrass in most situations, however, they have some unique properties that warrant further investigation.

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PUBLICATIONS

Altland, J.E. 2010. Use of Processed Biofuel Crops for Nursery Substrates. J. Environ. Hort. 28:129-134.

Altland, J.E., J. Owen, W. Fonteno. 2010. Developing moisture characteristic curves and their descriptive functions at low tensions for soilless substrates. J. Amer. Soc. Hort. Sci. (Accepted, In Press)

Altland, J.E. and C. Krause. 2010. Modification of switchgrass substrate ph using compost, peatmoss, and elemental sulfur. HortTechnology (Accpeted, In Press)

Altland, J.E. and C.K. Krause. 2009. Use of Switchgrass as a Nursery Container Substrate. HortScience 44:1861-1865.

PRESENTATIONS

"Alternative Substrates for Container-Grown Plants." The Ohio State University Horticulture Research Field Day, 10/5/2009.

GRANTS NOT-AWARDED

Fain, G., J. Altland, J. Owen, C. Boyer, E. Blythe, C. Gilliam, S. Leavengood, C. Landgren, T. Rinehart, C. Seavert, D. Sullivan, and G. Wehtje. 2010. Development of cost effective, renewable and regional substrates for production of containerized specialty crops. NIFA Specialty Crops Research Initiative. 5 years. Total request: $4,183,871; Boyer portion: $316,101.